ELSEVIER

Nuclear Instruments and Methods in Physics Research B 141 (1998) ix-xv

NIM B
Beam Interactions with Materials & Atoms

Contents

Preface vii

Committees viii

I. Fundamental processes of radiation effects in insulators

Radiation-induced point defects in simple oxides
E.A. Kotomin and A.I. Popov 1
Fast particle irradiation of solids: Excitation of secondary electrons and the related energy-deposition function
A. Miotello, R. Kelly and M. Dapor 16
Modeling the cascade amorphization of silicas with local-rules reconstruction
C.E. Jesurum, V. Pulim and L.W. Hobbs 25
Theoretical studies of lattice defect creation induced by exciton self-trapping in solid Ne
C. Fu and K.S. Song 35
Optical determination of the spatial extent of defects in insulators
D.Y. Smith and M.S. Malghani 42
On the role of thermal processes in sputtering and composition changes due to ions or laser pulses
R. Kelly and A. Miotello 49
First-principles investigation of radiation induced defects in Si and SiC
W. Windl, T.J. Lenosky, J.D. Kress and A.F. Voter 61
Laser induced intrinsic defects: Subpicosecond study of trapping kinetics
S. Guizard, C. Itoh, P. Martin, P. Meynadier, P. D'Oliveira, M. Perdrix and G. Petite 66
Ab initio simulations of silver film adhesion on α-Al_2O_3 (0 0 0 1) and MgO (1 0 0) surfaces
Yu.F. Zhukovskii, M. Alfredsson, K. Hermansson, E. Heifets and E.A. Kotomin 73
The kinetics of CaF_2 metallization induced by low-energy electron irradiation
M. Huisinga, N. Bouchaala, R. Bennewitz, E.A. Kotomin, M. Reichling, V.N. Kuzovkov and W. von Niessen 79
Stationary states of a two-state defect quadratically coupled to a few bosonic modes
A. Napoli, A. Messina and O. Puglisi 85
Modeling the metamictization of ion bombarded ceramics
P.M. Ossi and R. Pastorelli 89
Computer simulation of displacement energies for several ceramic materials
R.E. Williford, R. Devanathan and W.J. Weber 94
Effects of cascade mixing, sputtering and diffusion by high dose light ion irradiation of boron nitride
T.S. Pugacheva, F.G. Jurabekova and S.Kh. Valiev 99

II. Carbides, carbons

Ion-beam induced damage and annealing behaviour in SiC
E. Wendler, A. Heft and W. Wesch 105
Computer simulation of a 10 keV Si displacement cascade in SiC
R. Devanathan, W.J. Weber and T. Diaz de la Rubia 118

0168-583X/98/$19.00 © 1998 Elsevier Science B.V. All rights reserved

Amorphization of SiC under ion and neutron irradiation
L.L. Snead, S.J. Zinkle, J.C. Hay and M.C. Osborne 123
Formation and development of disordered networks in Si-based ceramics under ion bombardment
W. Bolse 133
Property change of polycrystalline diamond thin film due to self-ion irradiation
T. Terai and T. Kobayashi 140
Optical study of low energy ion-beam-assisted deposited diamond-like carbon films
Z.Y. Chen, Y.H. Yu, J.P. Zhao, C.X. Ren, X.Z. Ding, T.S. Shi and X.H. Liu 144
EELS analysis of SiC crystals under hydrogen and helium dual-ion beam irradiation
K. Hojou, S. Furuno, K.N. Kushita, N. Sasajima and K. Izui 148
Damage and ageing effects on proton beam irradiated C_{60} films
L.S. Farenzena, C.A. Perottoni, J.A.H. da Jornada, M.A. de Araújo, R.P. Livi and R.M. Papaléo 154
High dose MeV oxygen ion implantation into SiC
W. Wesch, A. Heft, H. Hobert, G. Peiter, E. Wendler and T. Bachmann 160

III. Polymers

Effects of MeV ions on PE and PVDC
A.L. Evelyn, D. Ila, R.L. Zimmerman, K. Bhat, D.B. Poker and D.K. Hensley 164
Ion beam assisted *unzipping* of PMMA
M.E. Fragalà, G. Compagnini, L. Torrisi and O. Puglisi 169
Ion beam modification of injection moulded polymere materials
G.K. Wolf and H.-J. Kersten 174
Depth profile of chemical species in multiple doped trimethylsilane film on Si(1 0 0) surfaces by low energy Ar ions
P.W. Wang and S. Bater 181
Polymer thermal stability enhancement induced by high energy ion beam bombardment
U.S. Sias, G. Sánchez, J.R. Kaschny, L. Amaral, M. Behar and D. Fink 187
VUV modification promotes endothelial cell proliferation on PTFE vascular grafts
J.L. Cezeaux, C.E. Romoser, R.S. Benson, C.K. Buck and J.E. Sackman 193
Contact angle lowering of polystyrene surface by silver-negative-ion implantation for improving biocompatibility and introduced atomic bond evaluation by XPS
H. Tsuji, H. Satoh, S. Ikeda, Y. Gotoh and J. Ishikawa 197
Fatigue crack propagation behavior of gamma irradiated LDPE films
R.S. Benson and Ma.E. Martinez Pardo 202
Analyses of Raman spectra for Na-ion implanted polyacetylene
M. Iwaki and H. Watanabe 206
Influence of nitrogen implantation on the properties of polymer films deposited in benzene glow discharges
E.C. Rangel, N.C. da Cruz, M.A. Bica de Moraes and L.C. Kretly 211
Damage profile examination on ion irradiated peek by ^{6}Li doping and neutron depth profiling technique
J. Vacík, J. Červená, V. Hnatowicz, V. Švorčík, Y. Kobayashi, D. Fink and R. Klett 216
Radiation effects of 1.3 keV electron and 1.486 keV X-ray photon on trimethylsilane doped Si(1 0 0) surfaces
P.W. Wang and J.H. Craig Jr. 223

IV. Colloids and clusters

Encapsulated semiconductor nanocrystals formed in insulators by ion beam synthesis
C.W. White, J.D. Budai, S.P. Withrow, J.G. Zhu, E. Sonder, R.A. Zuhr, A. Meldrum, D.M. Hembree Jr., D.O. Henderson and S. Prawer 228
Observation of micrometer size Li-metal colloids in electron-irradiated Li_2O crystals
F. Beuneu, P. Vajda and O.J. Zogal 241

High-energy Cu and O ion co-implantation into silica glasses
S. Nakao, K. Saitoh, M. Ikeyama, H. Niwa, S. Tanemura, Y. Miyagawa, S. Miyagawa, M. Tazawa and P. Jin 246
EXAFS study on metal cluster doped silica glass obtained by ion implantation procedures
G. Battaglin, E. Cattaruzza, F. D'Acapito, F. Gonella, P. Mazzoldi, S. Mobilio and F. Priolo 252
Modification of the optical properties of Ag nanoclusters by sequential implantation of Sc(Ti) and O in silica
R.H. Magruder III and R.A. Zuhr 256
Interaction of F_n-centers with gold nanocrystals produced by gold ion implantation in MgO single crystals
A. Ueda, R. Mu, Y.-S. Tung, M. Wu, W.E. Collins, D.O. Henderson, C.W. White, R.A. Zuhr, J.D. Budai, A. Meldrum, P.W. Wang and X. Li 261
Study of the effects of MeV Ag and Au implantation on the optical properties of $LiNbO_3$
E.K. Williams, D. Ila, S. Sarkisov, M. Curley, J.C. Cochrane, D.B. Poker, D.K. Hensley and C. Borel. . 268
Highly nonlinear optical composites obtained in silica and soda-lime glasses by Ti ion implantation and laser annealing
G. Battaglin, E. Borsella, E. Cattaruzza, F. Gonella, R.F. Haglund Jr., G. Mattei, P. Mazzoldi, D.H. Osborne Jr. and R. Polloni 274
Annealing behavior of tin implanted silica
Y.-S. Tung, A. Ueda, R. Mu, M. Wu, J. Chen, Z. Gu, D.O. Henderson, W.E. Collins, C.W. White and R. Zhur 279
Selenium nanoparticles formed by ion implantation into fused silica
D.O. Henderson, M. Wu, A. Ueda, Y.S. Tung, R. Mu, J. Chen, Z. Gu, W.E. Collins, C.W. White, J. Budai, A. Meldrum, R.A. Zuhr and J.G. Zhu. 284
Formation of metallic nanoclusters in silica by ion implantation
D. Ila, E.K. Williams, S. Sarkisov, C.C. Smith, D.B. Poker and D.K. Hensley 289
Third order optical nonlinearity of colloidal metal nanoclusters formed by MeV ion implantation
S.S. Sarkisov, E. Williams, M. Curley, D. Ila, P. Venkateswarlu, D.B. Poker and D.K. Hensley 294
Dose-rate dependence of negative copper ion implantation into silica glasses and effects on colloid formation
N. Kishimoto, V.T. Gritsyna, Y. Takeda, C.G. Lee and T. Saito 299
Formation of silver colloids on ion exchanged soda lime silicate glasses by irradiation
E.M. Yoshimura, E. Okuno, L. Krajczyk and M. Suszynska 304
Fabrication of copper and gold nanoclusters in MgO (100) by MeV ion implantation
R.L. Zimmerman, D. Ila, E.K. Williams, S. Sarkisov, D.B. Poker and D.K. Hensley. 308

V. Oxides

Applications of advanced electron microscopy techniques to the studies of radiation effects in ceramic materials
L.M. Wang 312
Annealing recovery of neutron irradiated $LiNbO_3$:Hf single crystals
J.G. Marques, A. Kling, C.M. de Jesus, J.C. Soares, M.F. da Silva, E. Diéguez and F. Agulló-López. . . 326
Damage recovery in ion-implanted TiO_2 at low temperatures
I. Khubeis, R. Fromknecht, S. Massing and O. Meyer 332
Investigation of radiation damage in ion implanted $KTiOPO_4$
W. Wesch, T. Opfermann and T. Bachmann 338
Radiation effects in pure and doped Al_2O_3 crystals
N. Kristianpoller, A. Rehavi, A. Shmilevich, D. Weiss and R. Chen 343
Effects of ionizing and displacive irradiation on several perovskite-structure oxides
A. Meldrum, L.A. Boatner and R.C. Ewing. 347
Chemical effects on the amorphization of sapphire
E. Alves, M.F. da Silva, J.G. Marques, J.C. Soares and K. Freitag 353
Radiation damage effects in cubic-stabilized zirconia irradiated with 72 MeV I^+ ions
K.E. Sickafus, H. Matzke, K. Yasuda, P. Chodak III, R.A. Verrall, P.G. Lucuta, H.R. Andrews, A. Turos, R. Fromknecht and N.P. Baker 358

Cryogenic radiation response of sapphire
R. Devanathan, W.J. Weber, K.E. Sickafus, M. Nastasi, L.M. Wang and S.X. Wang 366
Angular distribution of the sputtered atoms from UO_2 under high electronic stopping power irradiation
S. Bouffard, J.P. Duraud, M. Mosbah and S. Schlutig. 372
Afterglow of heavily irradiated sapphire
A. Flerov and V. Flerov 378
Afterglow rise in ruby at constant temperature
V.I. Flerov and A.V. Flerov 381
Radiation quenching of F-center emission in ruby
V.I. Flerov and A.V. Flerov 384
Lattice disorder and recovery in Pb implanted PZT thin films
R. Fromknecht, R. Aidam and O. Meyer. 387
Luminescence in Li_2O under ion beam irradiation
V. Grishmanov, S. Tanaka, K. Ogikubo and Q. Hu 392
Ion beam radiation damage effects in rutile (TiO_2)
T. Hartmann, L.M. Wang, W.J. Weber, N. Yu, K.E. Sickafus, J.N. Mitchell, C.J. Wetteland, M.A. Nastasi, M.G. Hollander, N.P. Baker, C.R. Evans, J.R. Tesmer and C.J. Maggiore 398
Irradiation effect on breakdown phenomenon of insulating materials
Q. Hu, S. Tanaka, T. Yoneoka and V. Grishmanov 404
Cavity formation in single crystal Al_2O_3 irradiated with triple beams of O, H and He ions
Y. Katano, K. Hojou, T. Nakazawa, T. Aruga, D. Yamaki and K. Noda 411
High-energy W ion implantation into VO_2 thin film
P. Jin, S. Nakao and S. Tanemura 419
Extremely fast decay component of UV luminescence from 2-MeV/amu ion irradiated alumina
K. Kimura, W. Hong, J. Kaneko and N. Itoh 425
Multiplication of electron–hole pairs in MgO crystals and ceramics
M. Kirm, E. Feldbach, T. Kärner, A. Lushchik, C. Lushchik, A. Maaroos, V. Nagirnyi and I. Martinson 431
Platinum implanted lithium niobate – annealing behavior and dopant redistribution
A. Kling, J.C. Soares and M.F. da Silva 436
Electrical property of high-fluence metal ion implanted sapphire and its thermal annealing effects
T. Kobayashi and T. Terai 441
Electron and neutron irradiation effects of Al_2O_3:V
Z. Jin, L.-B. Lin, L.-Z. Lin, S.-J. Jing, G.-C. Wang, Y. Lu and S.-Y. Jing 446
Defects in sapphire:Mn induced by neutron irradiation
L.-B. Lin, D.-L. Luo, C.-X. Zhang and T.-C. Lu 450
Influence of electron irradiation on H_2O adsorbed on the surface of rutile
T.-C. Lu, L.-B. Lin and C.-P. Zhao. 455
Radiation effects in corundum structure derivatives
J.N. Mitchell, R. Devanathan, N. Yu, K.E. Sickafus, C.J. Wetteland, V. Gopalan, M.A. Nastasi and K.J. McClellan 461
Effects of ion beam mixing on the depth profiles of thin metal layer in TiO_2
S. Miyagawa, K. Baba, S. Nakao, M. Ikeyama, K. Saitoh and Y. Miyagawa 467
Gray tracks in $KTiOPO_4$: Mechanism of creation and bleaching
V. Mürk, V. Denks, A. Dudelzak, P.-P. Proulx and V. Vassiltsenko. 472
Intrinsic electron excitations of KTiOPO4 crystals
P.-P. Proulx, V. Denks, A. Dudelzak, V. Mürk and V. Nagirnyi 477
High resolution TEM observation and density estimation of Xe bubbles in high burnup UO_2 fuels
K. Nogita and K. Une 481
Radiation damage in yttria-stabilized zirconia under Xe ion irradiation
N. Sasajima, T. Matsui, K. Hojou, S. Furuno, H. Otsu, K. Izui and T. Muromura 487
$LiNbO_3$ exposed to radio-frequency plasma
H. Turcicova, J. Vacik, J. Cervena, V. Perina, M. Polcarova, J. Bradler, V. Zelezny and J. Zemek 494

Neutron depth profiling study of lithium niobate optical waveguides
P. Kolářova, J. Vacík, J. Špirková-Hradilová and J. Červená 498
Temperature dependence of Kr ion-induced amorphization of mica minerals
L.M. Wang, S.X. Wang, W.L. Gong and R.C. Ewing 501
Ion irradiation-induced amorphization of $CaAl_2O_4$
S.X. Wang, L.M. Wang and R.C. Ewing 509
On the thermoluminescent properties and behaviour of Brazilian topaz
E.G. Yukihara and E. Okuno 514

VI. Ceramics - nonoxides

Ion beam-induced luminescence of Eu-implanted Al_2O_3 and CaF_2
K. Aono and M. Iwaki 518
Thermoluminescence of ion-implanted LiF crystals using 100 keV rare gas ions
A.T. Davidson, A.G. Kozakiewicz, D.J. Wilkinson, J.D. Comins and T.E. Derry 523
Photoemission from pure and electron irradiated CaF_2
M. Huisinga, V.E. Puchin and M. Reichling 528
Peculiarities of stable Frenkel defect formation in RbCl crystals
A. Lushchik, I. Kudryavtseva, M. Kirm, C. Lushchik, A. Maaroos and E. Vasil'chenko 533
Electron and hole trapping in $PbCl_2$ and $PbCl_2$:Tl crystals
S.V. Nistor, E. Goovaerts, M. Stefan and D. Schoemaker 538
Selective production of aggregate centers in LiF crystals by ionizing radiations
G. Baldacchini, E. De Nicola, G. Giubileo, F. Menchini, G. Messina, R.M. Montereali and A. Scacco. . 542
Thermoluminescence on polycrystalline AlN after γ and electron irradiation
S. Tanaka, Q. Hu, V. Grishmanov and T. Yoneoka 547
Subpicosecond absorption spectroscopy of band-gap excitation and defect formation in alkali halide crystals
E.D. Thoma, H.M. Yochum, P.A. Sheldon and R.T. Williams 552
Mechanisms of brittle fracture of solids exposed to intense-pulsed-electron-beams
A.N. Valyaev. 555
Heteroepitaxial growth of GaAs on Si substrates using low energy Ga and As ion beams
K. Yokota, S. Tamura and F. Miyashita 562

VII. Glasses and silica

Defect formation in amorphous SiO_2 by ion implantation: Electronic excitation effects and chemical effects
H. Hosono and N. Matsunami 566
Optical absorption and photosensitivity of N implanted silica
R.H. Magruder III, R.A. Weeks, R.A. Zuhr and D.K. Hensley 575
Radiation induced paramagnetic centres in nuclear glasses by EPR spectroscopy
B. Boizot, G. Petite, D. Ghaleb and G. Calas. 580
Comparison of the effect of fast-neutron irradiation on the induced tunneling states in silicon and quartz
M. Coeck, C. Laermans and E. Peeters 585
Defects in amorphous silica induced with monochromatic VUV rays
K. Awazu, K. Kanehira, H. Imai and H. Hirashima 589
Swift proton microbeam-induced diffusion in glasses
M. Mosbah and J.-P. Duraud 594
On the structure and radiation chemistry of iron phosphate glasses: New insights from electron spin resonance, Mössbauer, and evolved-gas mass spectroscopy
D.L. Griscom, C.I. Merzbacher, N.E. Bibler, H. Imagawa, S. Uchiyama, A. Namiki, G.K. Marasinghe, M. Mesko and M. Karabulut. 600

Ion implantation induced photosensitivity in Ge-doped silica: Effect of induced defects on refractive index changes
M. Essid, J.L. Brebner, J. Albert and K. Awazu 616
Structural relaxation of MeV ion-implanted silica glasses by thermal annealing
K. Fukumi, A. Chayahara, N. Kitamura, J. Nishii, Y. Horino, M. Makihara, K. Fujii and J. Hayakawa 620
Origin of enormous photon-induced volume expansion of GeO_2–SiO_2 thin glass films
J. Nishii, H. Yamanaka, H. Hosono and H. Kawazoe 625
Implantation-induced structural and surface modification of silica
C.M. Johnson, T.D. Thompson, M.C. Ridgway and V. Gurarie 629
Ultrasonic study of the tunneling states in neutron-irradiated quartz in the transition region
E. Peeters, C. Laermans, D.A. Parshin and M. Coeck 634
Enhanced diffusion of solute metals forming complexes with radiation defects in silica
J.C. Pivin, E. Garrido, G. Rizza and L. Thome 640
Secondary electron emission and surface potential of SiO_2 film surface by negative ion bombardment
H. Tsuji, Y. Gotoh and J. Ishikawa 645

VIII. Processing

Ion-induced conversion of polysiloxanes and polycarbosilanes into ceramics: Mechanisms and properties
J.C. Pivin, P. Colombo, M. Sendova-Vassileva, J. Salomon, G. Sagon and A. Quaranta 652
Formation of silicon carbide and nitride by ECR microwave plasma immersion ion implantation
K. Volz, W. Ensinger, B. Rauschenbach and B. Stritzker 663
Thermal annealing of waveguides formed by ion implantation of silica-on-Si
C.M. Johnson, M.C. Ridgway, A. Kurver, P.W. Leech and P.J. Simpson 670
VUV-light-induced deposited silica films
C.K. Buck, A.J. Pedraza, R.S. Benson and J.-W. Park 675
Investigation of Mn implanted $LiNbO_3$ applying electron paramagnetic resonance
A. Darwish, D. Ila, D.B. Poker and D.K. Hensley 679
Optical properties of ceramic-like layers obtained by low energy ion beam irradiation of polysiloxane films
G. Marletta, A. Tóth, I. Bertoti, T.M. Duc, F. Sommer and K. Ferencz. 684
Noble metal deposition on aluminum oxide powder surfaces by ion beam sputtering
W. Ensinger and H.R. Müller 693
Three-dimensional optical storage inside a silica glass by using a focused femtosecond pulsed laser
J. Qiu, K. Miura, H. Inouye, J. Nishii and K. Hirao. 699
Temperature effects on the fabrication of optical channels in planar GaAs/AlGaAs waveguides using MeV ions
T. Taylor, D. Ila, R.L. Zimmerman, J.C. Cochrane, P.R. Ashley, D.B. Poker and D.K. Hensley 704

IX. Laser–insulator interactions

Interaction of UV laser light with wide band gap materials: Mechanisms and effects
A.J. Pedraza 709
Analysis on UV-irradiated and 'as grown' silica sample with synchrotron radiation
A. Anedda, C.M. Carbonaro, R. Corpino and F. Raga. 719
Optical waveguides induced in inorganic glasses by a femtosecond laser
K. Miura, H. Inouye, J. Qiu, T. Mitsuyu and K. Hirao 726
Study of GaN films by pulsed laser photoelectron spectroscopy
J.L. LoPresti, S.C. Webb, R.T. Williams, W. Kim, H. Morkoç, A.E. Wickenden and D.D. Koleske 733

X. Swift heavy ions

Track formation and dislocation loop interaction in spinel irradiated with swift heavy ions
S.J. Zinkle and V.A. Skuratov 737

HREM investigation of latent tracks in GeS and mica induced by high energy ions
J. Vetter, R. Scholz, D. Dobrev and L. Nistor 747
Tracks induced in CaF_2 by MeV cluster irradiation
J. Jensen, A. Dunlop and S. Della-Negra 753

Author index 763